SYNOPSIS OF RESEARCH PROJECT

ON

CLIMATE CHANGE INDUCED CRISIS MANAGEMENT BY FARMERS OF COASTAL SAURASHTRA

UNDER THE GUIDANCE OF

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SYNOPSIS OF RESEARCH PROJECT

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9. Introduction

Climate change has emerged as one of the most critical global challenges affecting agricultural sustainability, food security and rural livelihoods. Agriculture is inherently sensitive to climatic conditions such as temperature, rainfall, humidity and seasonal variability, making it highly vulnerable to climate change. According to the Intergovernmental Panel on Climate Change (IPCC), global surface temperature has already increased by approximately 1.1°C above pre-industrial levels and further warming is expected to intensify extreme weather events including droughts, floods, cyclones and heat waves (IPCC, 2021). These changes are expected to significantly affect crop productivity, water availability and agricultural sustainability, particularly in developing countries.

Globally, agriculture contributes significantly to greenhouse gas emissions while simultaneously remaining one of the most vulnerable sectors to climate variability and extreme weather events. The Food and Agriculture Organization

(FAO) reported that climate change could reduce global crop yields by 10.00–25.00 per cent by 2050, depending on the severity of climate change and the adaptive capacity of farming systems (FAO, 2021). These impacts pose serious threats to food security and rural livelihoods, especially in regions where agriculture is the primary source of income.

India, being predominantly an agrarian country, is highly vulnerable to climate change due to its heavy dependence on monsoon rainfall and climate-sensitive agricultural systems. Nearly 54.60 per cent of the Indian population depends directly on agriculture for their livelihood and the sector contributes about 18.00 per cent to the national Gross Domestic Product (GDP) (Government of India, 2022). Climate variability has already begun to influence agricultural productivity through irregular rainfall patterns, rising temperatures and increasing frequency of extreme climatic events such as droughts, floods and cyclones. According to the Ministry of Environment, Forest and Climate Change, climate change may lead to a decline in crop yields by 10.00–40.00 per cent by the end of the century if appropriate adaptation measures are not adopted (Government of India, 2018).

Coastal regions are particularly vulnerable to the adverse effects of climate change because of their exposure to sea level rise, cyclonic storms, storm surges and saline water intrusion. Agricultural systems in coastal areas often face challenges such as soil salinity, waterlogging, land degradation and crop damage caused by extreme weather events. Such climatic disturbances increase the vulnerability of farming communities and threaten their livelihood security.

The state of Gujarat, having the longest coastline in India, is particularly exposed to marine-related climatic hazards such as cyclones, storm surges, coastal flooding and salinity intrusion. Owing to these geographical characteristics, the state has been identified as one of the regions highly vulnerable to climate-induced extreme events (Mall *et al.,* 2006).

Recent climatic trends over the Arabian Sea indicate an increasing frequency and intensity of cyclonic disturbances during the pre and post-monsoon seasons. Such climatic events pose serious threats to agriculture and rural livelihoods in the coastal belt of Gujarat. In recent years, severe cyclones such as **Cyclone Tauktae** (2021) and **Cyclone Biparjoy** (2023) caused considerable damage to crops, livestock and rural infrastructure in the Saurashtra region, highlighting the growing vulnerability of farmers to climate-induced crises. These changing climatic patterns have made it

increasingly important to understand farmers' preparedness, awareness and adaptive capacity in managing climate-related risks (Jaryal *et al*., 2025).

Farmers often adopt various coping and adaptation strategies to manage climate-induced crises in agriculture. These strategies may include crop diversification, adoption of drought-tolerant varieties, modification of sowing dates, soil and water conservation practices, utilization of weather advisory services and improved farm management practices. However, the effectiveness of these strategies varies widely among farmers depending on their socio-economic conditions, access to resources, technological awareness and institutional support systems (Feliciano, 2019; Khatri-Chhetri *et al*., 2016).

Understanding how farmers respond to climate-induced crises and identifying the factors influencing their crisis management behaviour are therefore crucial for developing effective extension strategies and climate adaptation policies. In this context, analysing farmers' crisis management practices and their determinants can provide valuable insights for strengthening climate resilience in agricultural systems.

Considering the increasing vulnerability of coastal agriculture to climate variability and the need for effective crisis management strategies, the present study entitled **"Climate Change Induced Crisis Management by Farmers of Coastal Saurashtra"** has been undertaken to examine farmers' responses to climate-related risks and to determine the factors affecting their capacity to cope with climate induced crises.

9.1 Statement of the problem

Agriculture in the coastal region of Saurashtra is highly vulnerable to climate variability and extreme weather events such as droughts, erratic rainfall, cyclones and salinity intrusion. These climate-induced stresses frequently disrupt crop production, reduce farm income and increase livelihood insecurity among farmers.

Although several climate-resilient agricultural technologies and government support programmes have been introduced to help farmers cope with climate change, their adoption and effectiveness at the field level remain limited. Farmers differ widely in their ability to manage climate-related crises due to differences in knowledge, resources, institutional support and access to technological information.

In addition, emerging factors such as weather advisory services, farm mechanization, access to climate information and institutional support may also influence farmers' ability to manage climate-related crises. However, limited research

has been conducted to systematically examine these factors in the coastal Saurashtra region.

Therefore, there is a need for a comprehensive study to understand the crisis management practices adopted by farmers, the factors influencing their responses and the constraints they face while dealing with climate change induced crises. Such information will be useful for designing effective extension programmes, policy interventions and climate adaptation strategies for farmers in coastal areas.

9.2 Significance of study

Climate change is increasingly affecting agricultural production and rural livelihoods, particularly in coastal regions that are highly vulnerable to climatic hazards. Farmers in these regions frequently face climate-induced crises such as cyclones, erratic rainfall and salinity intrusion. Understanding how farmers respond to these challenges is essential for strengthening climate resilience in agriculture.

The present study will provide a comprehensive understanding of the crisis management practices adopted by farmers in coastal Saurashtra. The findings will help identify the factors influencing farmers' ability to cope with climate-related risks and the challenges they face in adopting climate-resilient practices.

The results of the study will be useful for extension agencies in designing need-based training programmes and climate advisory services to enhance farmers' adaptive capacity. Policymakers can utilize the findings to develop more effective policies related to climate adaptation, disaster management and agricultural sustainability.

The study will also contribute to the existing body of knowledge in agricultural extension research by providing empirical evidence on farmers' climate crisis management behaviour. Furthermore, the findings will be useful for researchers in developing location-specific climate-resilient agricultural technologies and strategies.

10 Practical Utility of Study

The present study will have significant practical implications for various stakeholders involved in agricultural development and climate adaptation.

The findings will help policymakers design effective climate adaptation programmes and support policies for farmers in coastal Saurashtra. Extension agencies can utilize the results to develop targeted training programmes and weather advisory services that enhance farmers' preparedness for climate-related crises.

The study will also provide useful insights for agricultural scientists and researchers in developing climate-resilient technologies suitable for coastal farming systems. By identifying the constraints faced by farmers, the study will help in designing strategies to overcome barriers in adopting climate-resilient agricultural practices.

From the farmers' perspective, the study will help identify effective crisis management strategies that can reduce climate-related risks and improve livelihood security. The findings may also serve as a valuable reference for future research studies focusing on climate change adaptation and crisis management in agriculture.

11 Objectives of the Study

Considering the background and the problem statement, the present research on **"Climate Change Induced Crisis Management by Farmers of Coastal Saurashtra"** is carried out with the following objectives:

1. To study the profile of the farmers in coastal areas of Saurashtra
2. To measure the knowledge level of farmers regarding climate change induced crisis management
3. To develop and standardize a scale to measure climate change induced crisis management among the farmers in coastal Saurashtra
4. To examine the relationship between the profile of farmers with their knowledge and climate change induced crisis management
5. To know the constraints experienced by farmers in managing climate change induced crisis
6. To seek suggestions from farmers to overcome constraints in managing climate change induced crisis

12 Brief Review of Literature

There are very few studies so far conducted and reported in India as such on problem under study, however attempts are made and same is presented in the light of the objectives under the following heads.

12.1 Profile of the respondents

12.1.1 Personal characteristics

12.1.1.1 Age

Khati and Amardeep (2020) revealed that more than two-fifth (41.00%) of respondents were belong to the middle age group (44 - 55 years), while 32.00 per cent

and 27.00 per cent of respondents were belong to young age group (up to 43 years) and old age group (above 55 years), respectively.

Desai and Regatipally (2025) stated that majority (63.33%) of farmers were in the age group of 25–45 years, followed by 28.33 per cent and 08.33 per cent of farmers belong to above 45 years and less than 25 years of age group, respectively.

12.1.1.2 Education

Mallappa and Pathak (2023) observed that less than two-fifth (39.20%) of the respondents had secondary level education, followed by higher-secondary education (22.50%), degrees and above (20.00%), and primary education (18.30%).

Desai and Regatipally (2025) stated that less than two-fifth (38.30%) of farmers had secondary level of education, followed by 28.30 per cent, 25.00 per cent, 06.70 per cent, 01.70 per cent and 00.00 per cent of farmers had bachelor's degree, primary school, no formal education, master's degree and doctorate level of education, respectively.

12.1.1.3 Farming experience

Barman (2020) indicated that majority (63.00%) of the respondents had medium level (10-39 years) farming experience, followed by 27.00 per cent respondents with high level or long-term experience (above 39 years). Only 10.00 per cent of the respondents had low level or short term farming experience (less than 10 years).

Sandeep *et al.* (2023) concluded that more than one-third (37.22%) of respondents had medium level of farming experience, followed by low levels (31.67%) and high levels (31.11%) of farming experience.

12.1.2 Socio-economic characteristics

12.1.2.1 Annual income

Bhong *et al*. (2020) revealed that less than half (46.66%) of farmers had medium annual income (₹ 50463 to ₹ 278661), followed by 41.67 per cent respondents belongs to low (Up to ₹ 50462) annual income category per year and 11.66 per cent of farmers had high annual income (₹ 278662 and above) category.

Bhattacharjee (2025) revealed that less than one-half (48.00 per cent) of the respondents belonged to the income group of ₹ 50,001 to ₹ 1, 00,000, followed by 35.00 per cent of the respondents belonged to the income group of up to ₹ 50,000, whereas 09.00 per cent and 08.00 per cent of the respondents were having income of above ₹ 2, 00,000 and ₹ 1, 00,001 to ₹ 2, 00,000, respectively.

12.1.2.2 Land holding

Barman (2020) indicated that majority (63.50%) of respondents were belong to the group of 1.2-3.2 ha that means medium land holding, followed by greater than 3.28 ha that means high land holding (19.50%) and less than 1.24 ha land holding that means small land holding (17.00%) category.

Rathava (2023) reported that exactly half (50.00%) of the farmers had semi medium land holding, followed by 22.50 per cent of the farmers had medium land holding and 21.25 per cent of the farmers had small land holding. Whereas, 06.25 per cent of the farmers had marginal land holding and none of the farmer had big land holding.

12.1.2.3 Credit support

Chigadolli (2022) suggested that slightly more than one-third (34.17%) of farmers received high credit support, followed by 33.33 per cent and 32.50 per cent were received low and medium credit support, respectively.

Sanjay (2023) indicated that more than one-third (40.83%) of respondents belong to medium credit support, followed by low (31.67%) and high (27.50%) credit support.

12.1.3 Communicational characteristics

12.1.3.1 Mass media exposure

Bharat *et al.* (2021) found that more than two-fifth (43.33%) of the respondents had low mass media exposure, followed by high (30.00%) and medium (26.67%) level of mass media exposure.

Mallappa and Pathak (2023) concluded that slightly more than two-fifth (42.90%) of the respondents had low level of mass media exposure, while 35.40 per cent had medium and 21.70 per cent had high level of mass media exposure.

12.1.4 Psychological characteristics

12.1.4.1 Scientific orientation

Shwetha and Shivalingaih (2018) reported that nearly two-fifth (37.50%) of the respondents were found in high scientific orientation category, while medium (36.66%) and low (25.84%) scientific orientation category.

Limbachiya (2022) depicted that nearly two-third (65.56%) of the respondents had medium level of scientific orientation, followed by 20.55 per cent and 13.89 per cent of respondents had high and low level of scientific orientation, respectively.

12.1.4.2 Risk orientation

Saravanan *et al*. (2020) depicted that majority (75.00%) of the respondents were medium risk takers, followed by 13.00 per cent and 12.00 per cent in high and low level of risk bearing ability, respectively.

Jaryal *et al*. (2025) found that that slightly more than half (51.25%) of the farmers had medium level of risk orientation, followed by 32.50 per cent and 16.25 per cent of them had high and low levels of risk orientation, respectively.

12.1.4.3 Deferred gratification

Shwetha and Shivalingaih (2018) concluded that more than half (57.50%) of the respondents had medium deferred gratification, while 22.50 per cent and 20.00 per cent had low and high level of deferred gratification, respectively.

Sanjay (2023) observed that more than half (52.50%) of respondents had high deferred gratification, followed by medium (38.33%) and low (09.17%) level of deferred gratification.

12.1.4.4 Attitude towards crisis

Naik *et al*. (2024) indicated that nearly two-third (65.00%) of the respondents had highly favourable attitude, followed by moderate (33.00%) and less (02.00%) favourable attitude, respectively.

Sindhu *et al.* (2024) revealed that more than two-fifth (43.75%) of farmers were under favourable attitude, followed by unfavorable attitude (32.92%) and most favourable attitude (23.33%).

12.1.5 Situational characteristics

12.1.5.1 Irrigation potentiality

Tankodara (2019) reported that less than half (47.50%) of the respondents had medium level of irrigation potentiality, followed by 30.00 per cent and 22.50 per cent of the respondents had low and high irrigation potentiality, respectively.

Pokar (2023) concluded that more than three-fifth (62.50%) of the beneficiaries had medium irrigation potentiality, followed by 20.83 per cent had high and 16.67 per cent had low irrigation potentiality. While in case of non-beneficiaries, more than half (53.33%) of respondents had medium level irrigation potentiality, followed by 25.84 per cent had low and 20.83 per cent had high irrigation potentiality.

12.1.5.2 Cropping intensity

Mohammad (2020) reported that more than three-fourth (77.50%) of respondents had medium level of cropping intensity, followed by 15.83 per cent and 06.67 per cent of the respondents had high and low level of cropping intensity, respectively.

Barman (2023) indicated that slightly less than two third (65.50%) of respondents belong to medium cropping intensity, followed by high cropping intensity (18.50%) and low cropping intensity (16.00%) category.

12.1.5.3 Prior exposure to crisis

Saravanan *et al.* (2020) observed that that more than one-third (39.00%) of the respondents had less extent of prior exposure to crisis, followed by 31.00 per cent and 30.00 per cent in high and medium extent of exposure categories, respectively.

Chigadolli (2022) suggested that more than two-fifth (44.58%) of respondents had falls in to medium category of prior exposure to crisis, followed by 34.17 per cent were had low exposure and 21.25 per cent were comes under high prior exposure to crisis.

12.1.5.4 Farm mechanization index

Rajkhowa *et al.* (2020) reported that majority (67.50%) of the respondents belonged to medium farm mechanization category, followed by 22.50 per cent to low farm mechanization category and remaining 10.00 per cent belonged to high farm mechanization category.

Aruna *et al.* (2024) revealed that the mechanization index was high in seedbed preparation (98.46%), followed by irrigation (97.37%) and weeding/spraying operation (57.81%). The mechanization index was zero for planting and harvesting operations since the majority of farmers were performing operation manually and also unaware and unavailability of equipment's for the particular operation.

12.1.5.5 Sources of weather information

Rathava (2023) analyzed that less than two-fifths (38.75%) of the farmers were used television to access the information about weather forecast, followed by 33.75 per cent of the farmers were used mobile phone, 13.75 per cent of the farmers received weather forecast information from their localize farmers, 10.00 per cent of the farmers received weather forecast information from research scientists and only 03.75 per cent of the farmers were used newspaper for information about weather forecast.

Gacheno *et al.* (2025) reported that more than two-fifth (40.49%) of respondents had no weather information sources, followed by 27.00 per cent of the tested households got their weather updates from radio, 18.45 per cent from development agents, 12.95 per cent from other sources and the remaining 01.10 per cent from television.

12.2 Knowledge level of farmers

Islam *et al.* (2019) revealed that more than two-fifth (46.10%) of the respondents had medium knowledge on climate change, while (32.70%) and (21.20%) having high and low knowledge categories, respectively.

Raval *et al.* (2023) found that nearly two thirds (65.92%) of the respondents had medium level of knowledge about crisis management practices, followed by 17.41 per cent had low and 16.67 per cent had high level of knowledge about crisis management practices.

12.3 Climate change induced crisis management

Ninama *et al.* (2023) unfolded that less than two-fifth (38.50%) of farmers of Bhal region had high level of overall crisis management efficiency, followed by 29.50 per cent each of them had medium and low level of overall crisis management efficiency. While only 02.50 per cent of them had very high level of overall crisis management efficiency and no Bhal farmer had very low level of crisis management efficiency.

Vamshi *et al.* (2025) observed that nearly-half (46.66%) of the nursery owners fall into the medium level crisis management category, followed by 30.67 per cent demonstrate high-level crisis management and 22.67 per cent exhibit low-level performance.

12.4 Relationship between the profile of farmers with their knowledge and climate change induced crisis management

12.4.1 Profile of farmers with their knowledge

Chouhan *et al.* (2018) concluded that age, education, land holding, farming experience and annual income had positive and highly significant relation with the knowledge level about climate change and weather in relation to crop management.

Raval *et al.* (2023) depicted that education and risk orientation had positive and highly significant relationship with knowledge about crisis management practices, while cropping intensity had positive and significant relationship. Whereas, age,

farming experience, land holding, annual income and source of irrigation exerted non-significant relationship with knowledge about crisis management practices.

12.4.2 Profile of farmers with climate change induced crisis management

Gohil *et al.* (2016) analyzed that there was positive and highly significant association between the crisis management practices and their education, risk orientation and knowledge. There was no association between the crisis management practices adopted by cotton growers and their size of land holding and irrigation index, while age and index of farm experience were negative and highly significant relation with crisis management practices.

Sanjay (2023) depicted that age and deferred gratification were positively and significantly associated at 5 per cent significance level. Farm experience, annual income, scientific orientation and attitude towards crisis were associated with their crisis management behaviour at one per cent level of significance, positively. Education and knowledge were found to be not significantly associated with crisis management behaviour and land holding, irrigation source and credit support were found to be negative and non- significantly associated with crisis management behaviour.

12.5 Constraints experienced by farmers

Namdeo *et al.* (2023) observed that major constraints faced by respondents was destruction of crops by erratic climatic events results in financial and mental instability of the farmers' which ranked I, followed by small size (ranked II), fragmented land holdings and unavailability of labours (ranked III), fear of what will be the consequence of climate resilient technologies and adaptation strategies (ranked IV), lack of information about climate change (ranked V), low literacy level (ranked VI) and facing social and cultural barriers that make it challenging to adopt climate smart agricultural practices (ranked VII).

Patel *et al.* (2025) indicated that high cost for implementing water harvesting and conservation measures was reported as a major constraints and got first ranked, followed by lack of adequate awareness about climate resilient technologies (ranked II), market instability and price fluctuations (ranked III), more reliance on traditional method of farming (ranked IV), lack of knowledge and understanding about climate change issue (ranked V), inadequate infrastructure for fodder and input storage (ranked VI), lack of awareness about drought tolerant Varieties (ranked VII), limited access to credit and financial services (ranked VIII), lack of effectively and timely

weather advisory systems (ranked IX) and labour shortages during critical farm operations (ranked X).

12.6 Suggestions to overcome the constraints

Namdeo *et al.* (2023) revealed that majority of the farmers (87.23%) were suggested, weather forecasting and delivering of information should be more accurately and timely given, followed by 76.60 per cent of the farmers said that there should be more and frequent visits of the extension personnel to help and assist farmers on climate resilient related technologies and practices. Similarly, 75.74 per cent of the farmers proposed that there should be proper assessment of crop damages and compensation should be timely delivered to the farmers to avoid any financial crises. Moreover, 69.36 per cent of the farmers submitted their suggestion as government should build more water harvesting infrastructure to reduce scarcity of irrigation water during the Rabi crops. Also, 68.09 per cent and 65.53 per cent of the farmers suggested that MSP for crops is to be issue according to the cost of cultivation of particular crop and availability of farm machineries at custom hiring centers should be ensured. Furthermore, 60.85 per cent of the farmers proposed that early warnings are to be issued in case of adverse weather conditions whereas 54.89 per cent said that government should ensure availability of inputs near to village throughout the year. About 51.06 per cent of the farmer's recommended that regular awareness camps to be arranged for better awareness regarding climate change and 40.85 per cent propounded that there is need to increase the coverage of training programs which enumerates more number of farmers so that majority of the farmers can get exposure to climate resilient technologies and practices, respectively.

Patel *et al.* (2025) depicted that weather forecasting and delivering of information should be more accurate and timely was observed as a major suggestion with first ranked, followed by there should be proper assessment of crop damage and compensation should be timely deliver to the farmers (ranked II), government should built more water harvesting infrastructure to reduce scarcity of irrigation water (ranked III), early warnings is to be issued in case of adverse weather conditions (ranked IV), more and frequent visits of extension agents should be there to help and assist farmers on climate resilient technology (ranked V) and government should ensure availability of inputs near to village throughout the year (ranked VI).

13 Research Methodology

Research methodology refers to the systematic procedures and techniques adopted for conducting a scientific investigation. It explains the methods used for selecting the study area, sampling of respondents, measurement of variables, and techniques employed for collection and analysis of data. The methodological framework adopted for the present study is described below.

13.1 Identification of the problem

Climate change has become one of the major challenges affecting agricultural production and the livelihood security of farmers, particularly in coastal regions where climatic risks are more frequent and severe. Farmers in the coastal areas of the Saurashtra region are increasingly exposed to climatic disturbances such as irregular rainfall, droughts, cyclones and salinity intrusion, which create significant challenges for agricultural sustainability. In order to cope with such climatic uncertainties, farmers adopt different crisis management strategies depending upon their socio-economic conditions, access to resources, awareness of climate-related information and institutional support. However, the extent to which farmers effectively manage climate-induced crises and the factors influencing their crisis management behaviour are not adequately documented in the coastal Saurashtra region.

Considering the importance of understanding farmers' responses to climate-related risks, the present investigation entitled **"Climate Change Induced Crisis Management by Farmers of Coastal Saurashtra"** was conceptualized and discussed with the major advisor and experts in the field of agricultural extension. The findings of this study are expected to provide useful insights for researchers, extension personnel and policy makers in developing suitable climate adaptation and crisis management strategies for farmers.

13.2 Sources of data

The present study will be based on both primary and secondary data.

Primary data will be collected directly from the selected farmers through personal interviews using a well-structured and pre-tested interview schedule prepared in accordance with the objectives of the study.

Secondary information relevant to the study will be obtained from various sources such as research reports, books, journals, bulletins, government publications and records available with agricultural departments, research institutions and other organizations related to climate change and agricultural development.

13.3 Area of the study

The study will be conducted in the coastal region of Saurashtra in Gujarat state, which is frequently affected by climate-related stresses such as cyclones, rainfall variability, drought conditions and salinity intrusion. Agriculture is the predominant occupation in this region and farmers are increasingly required to adopt various strategies to manage climate-induced crises. Therefore, the region provides a suitable setting for investigating farmers' crisis management behaviour under changing climatic conditions.

13.4 Research design

The present investigation will be carried out using an ex-post facto research design. In this type of research design, the investigator studies the existing situation without manipulating the independent variables, as the events have already occurred. The researcher observes and analyses the relationships between dependent and independent variables to understand the factors influencing the phenomenon under study (Kerlinger, 1973).

13.5 Sampling technique

A purposive and multistage sampling procedure will be followed for selecting the respondents for the study. The details of the sampling procedure are presented below.

13.5.1 Selection of districts

At the first stage, four coastal districts of the Saurashtra region, namely Junagadh, Gir Somnath, Porbandar and Devbhumi Dwarka, will be selected purposively for the present study. These districts are located along the coastal belt of Gujarat and are frequently exposed to climate-related risks such as cyclones, salinity intrusion and rainfall variability. The purposive selection of these districts will ensure that the study encompasses farmers who regularly experience climate change–induced crises in agriculture, thereby making the area highly relevant for investigating farmers' crisis management behaviour.

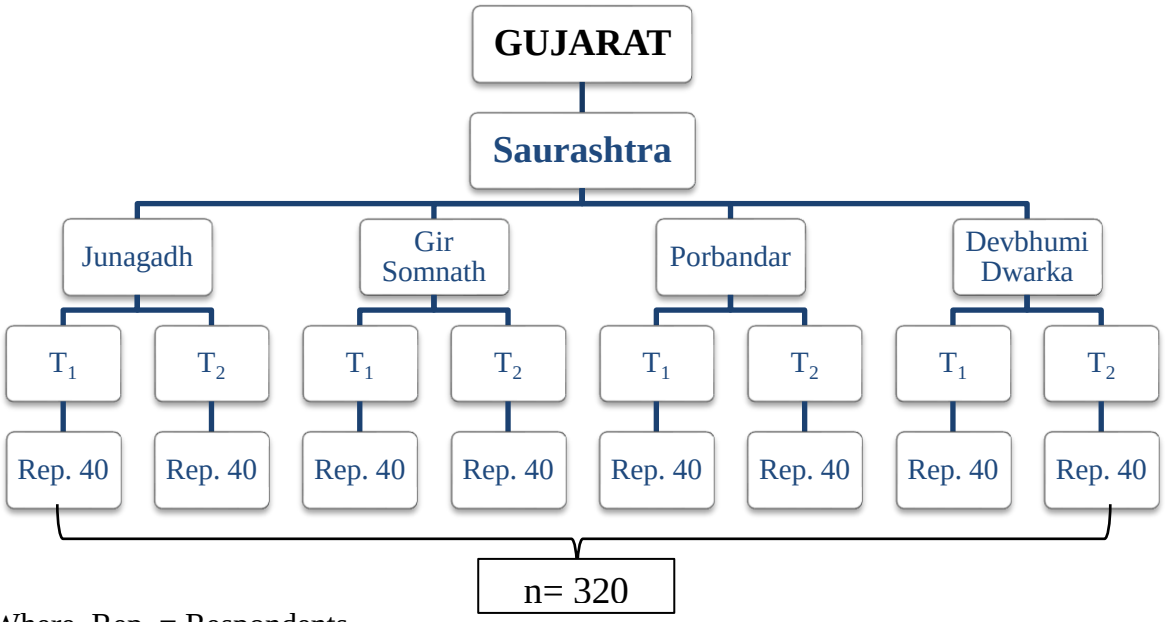
13.5.2 Selection of talukas

From each of the selected districts, two talukas will be selected by using a random sampling method in order to avoid selection bias and to ensure adequate representation of different areas within each district.

13.5.3 Selection of respondents

A comprehensive list of farmers from the selected villages will be prepared with the assistance of local agricultural officers, village records and other relevant sources. From each selected taluka, forty farmers will be selected using a random sampling technique to ensure adequate representation of farmers engaged in agricultural activities and exposed to climatic risks.

Thus, a total of 320 respondents will constitute the sample for the present study (4 districts × 2 talukas × 40 farmers). The selected farmers will be personally interviewed by the investigator using a structured and pre-tested interview schedule in order to collect the required information regarding their socio-economic characteristics and their practices adopted for managing climate change–induced crises in agriculture.



Where, Rep. = Respondents

Figure 1: List of selected districts, talukas and respondents of Saurashtra region for data collection

13.6 Measurement of variables

13.6.1 Measurement of independent variables

Sr. No.	Variables	Measurement techniques
Personal Characteristics		
1	Age	Chronological age of the respondents
2	Education	Structure schedule will be used.
3	Farming experience	Structure schedule will be used.

Socio-economic Characteristics		
4	Annual income	Actual income of the respondents
5	Land holding	Structure schedule will be used.
6	Credit support	Procedure followed by Vinay Kumar (2015) will be used.
Communication Characteristics		
7	Mass media exposure	Scale developed by Nirban (2004) will be used.
Psychological Characteristics		
8	Scientific orientation	Scale developed by Supe (1969) will be used.
9	Risk orientation	Scale developed by Supe (1969) will be used with due modifications.
10	Deferred gratification	Scale developed by Rame Gowda (1991) will be used.
11	Attitude towards crisis	Structure schedule will be used.
Situational characteristics		
12	Irrigation potentiality	Scale developed by Geethakutty (1993) will be used with due modifications.
13	Cropping intensity	Formula developed by Singh (1981) will be used.
14	Prior exposure to crisis	Structured schedule will be used.
15	Farm mechanization index	Scale developed by Singh and Singh (1970) will be used.
16	Sources of weather information	Structured schedule will be used.

13.6.2 Measurement of dependent variables

Sr. No.	Variables	Measurement techniques
1	Knowledge about crisis management	Teacher made scale will be used for the study.
2	Climate change induced crisis management	Scale will be developed and used for the study.

13.6.3 Constraints experienced by farmers in managing climate change induced crisis

To identify the constraints experienced by farmers in managing climate change induced crises in agriculture, an exploratory approach will be followed. The respondents will be encouraged to express the difficulties they encounter while adopting various crisis management practices such as crop diversification, water management practices, use of weather advisory services, adoption of improved technologies and other adaptive measures.

The constraints expressed by the respondents will be recorded carefully and categorized accordingly. The frequency and percentage of each constraint will be calculated to determine their extent. Further, the constraints will be ranked based on the percentage of responses in order to identify the most significant constraints faced by the farmers.

13.6.4 Suggestions expressed by the farmers to overcome the constraints

To obtain suggestions for overcoming the constraints related to climate change–induced crises in agriculture, the respondents will be requested to provide their opinions and recommendations. The suggestions offered by the farmers will be collected and categorized systematically.

The frequency and percentage of each suggestion will be calculated, and the suggestions will be ranked according to their relative importance based on the percentage of responses.

13.7 Tools of data collection and field procedure

An interview schedule will be developed to collect information relevant to the objectives of the study. The schedule will consist of items related to both dependent and independent variables included in the study. Before finalizing the interview schedule, it will be pre-tested with a small group of farmers outside the sample area in order to ensure clarity, relevance and suitability of the questions. Based on the feedback obtained during the pre-testing stage, necessary modifications will be made. The finalized interview schedule will be translated into the Gujarati language for better understanding by the respondents. The investigator will personally approach the respondents and conduct face-to-face interviews following the standard principles of interviewing to obtain accurate and reliable responses. The information provided by the respondents will be recorded in the interview schedule itself.

13.8 Collection of data

The required data for the study will be collected through personal interviews with the selected respondents using the structured interview schedule. During the interview process, efforts will be made to ensure that the respondents clearly understand each question. Whenever necessary, additional explanations will be provided to facilitate accurate responses. The investigator will record all the responses carefully to ensure completeness and reliability of the collected data.

14 Statistical Analysis

After the completion of data collection, the responses obtained from the respondents will be carefully examined, coded and transferred to a master sheet for further analysis. The data will then be compiled, tabulated and analyzed using appropriate statistical techniques in order to achieve the objectives of the study.

14.1 Percentage (%)

Percentage will be used to make the simple comparison of different groups where ever needed.

$$\textbf{Per cent} = \frac{\textbf{Frequency}}{\textbf{Number of respondents}} \times 100$$

14.2 Frequency (f)

Number of times a variate value is repeated.

14.3 Range

$$\boldsymbol{Range = Maximum\ value - Minimum\ value}$$

14.4 Arithmetic mean ($\bar{X}$)

The mean is the result of the sum of all items in the series divided by the number of items. The formula is as under:

$$\bar{X} = \frac{\sum X_i}{n}$$

Where,

$\bar{X}$ = Mean

n = Number of respondents

X_i = Value of the i^{th} respondents

14.5 Standard Deviation (S. D.)

The standard deviation will be obtained by the square root of the average of the square deviation from mean by the following formula.

$$S.D. = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n-1}}$$

Where,

Xi = Individual score

$\bar{X}$ = Mean score

n = Total number of respondents

Σ = Sum

The maximum and minimum score limits will be obtained by the following formula.

$$Xi = \text{Mean} \pm \text{S.D.}$$

14.6 Arbitrary method

Generally arbitrary method will be used on adhoc basis and designed largely through researcher's own subject selection for formulation of groups of different variables. In this study, different variables will be categorized based on division of difference between maximum and minimum possible score of respective variables with its numbers of categories. The score thus obtained is added into the minimum score until getting the maximum score.

14.7 Correlation coefficient (r)

The coefficient of correlation will be computed to find out the linear relationship between the variables. The correlation coefficient gives two kinds of information (i) degree of relationship and (ii) direction of the relationship (whether positive or negative) between any two variables. For computing, the correlation coefficient 'r' the Karl Pearson's method will be used as under.

$$r_{XY} = \frac{\sum XY - \frac{(\sum X)(\sum Y)}{n}}{\sqrt{\sum X^2 - \frac{(\sum X)^2}{n}} \sqrt{\sum Y^2 - \frac{(\sum Y)^2}{n}}}$$

Where,

r = Correlation coefficient

Σ = Summation

X = Profile of the farmers

Y = Attitude of farmers towards the use of Gir Sawaj bio-agents

n = Total number of respondents

14.8 Stepwise regression analysis

The stepwise regression method is a combination of forward selection and backward elimination to know the effect of independent variables on dependent

variable. The stepwise multiple linear regression method is used to determine the most significant independent variables to include in a multiple linear regression model. At each step of analysis, a variable is added or removed which results in the greatest prediction in the error sum of squares (Burroughs Corporation, 1975). The stepwise regression will be carried out with the help of SPSS software. From the output, we can interpret based on the values of the multiple coefficient of determination (R^2), multiple correlation coefficient (R) and adjusted multiple coefficient of determination (adjusted R^2).

The prediction equation will be used as:

$$\mathbf{Y = a + b_1X_1 + b_2X_2 + \ldots\ldots + b_kX_k + e}$$

Where,

Y = Dependent variable

a = Intercept

$b_1 \ldots b_k$ = Partial regression coefficient of respective independent variables

$X_1 \ldots X_k$ = Independent variables

e = Error variable

15 References

Aruna, T. N.; Kumar, B. K; Ramappa; Hallad, S. C.; Kumar, K. V.; Kumar, K.; Singh, A. K. and Krishnan, S. V. (2024). Assessment of Mechanization Index of Sugarcane Cultivation in Mandya District, Karnataka, India. *Archives of Current Research International,* **24(5)**: 251-256.

Barman, I. (2020). Assessment of agricultural extension needs of farmers for disaster resilience in Dhemaji district of Assam. Ph. D. Thesis (Unpublished), Uttar Banga Krishi Viswavidyalaya, West Bengal.

Barman, I. (2023). Assessment of agricultural extension needs of farmers for disaster resilience in Dhemaji district of Assam. Ph. D. (Agri.) Thesis (Unpublished), Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal.

Bharat, Chapke, R. and Kammar, S. (2021). Farmers' perception on climate change and agricultural adaptation strategies. International Journal of Extension Education, (16): 99-108.

Bhattacharjee, A. (2025). Awareness and adoption of climate-resilient agricultural practices by farm women in the Saurashtra region. M. Sc. (Agri.) Thesis (Unpublished), Junagadh Agricultural University, Junagadh.

Bhong, M. U.; Kadam, R. P. and Pawar, G. S. (2020). Relationship between farmer's profile with their perception about climate change. *Advanced Agricultural Research & Technology Journal* **4(2)**: 188-192.

Burroughs corporation (1975). "*Burroughs Advanced Statistical inquiry system user's manual*", Burroughs Corporation, Detriot, Michigan.

Chigadolli, M. (2022). Crisis management by sugarcane growers of Northern Karnataka – an analysis. Ph. D. (Agri.) Thesis (Unpublished), University of Agricultural Sciences, Bengaluru.

Chouhan, G.; Suradkar, D. D. and Anarase, M. S. (2018). Farmers knowledge of climate change in relation to crop management. *Int.J.Curr.Microbiol.App.Sci*., Special Issue-**6**: 2445-2451.

Desai, R. and Regatipally, D. (2025). Assessing farmer perceptions and adaptive responses to climate change in crop production. *Indian Res. J. Ext. Edu.*, **25(2&3)**: 92-101.

Dewey, D. R. and Lu, K. H. (1959). A correlation and path co-efficient analysis of components of crested wheat grass seed production. *Journal of Agronomy*, **51(9)**: 515-518.

FAO. (2021). *The state of food and agriculture 2021: Making agrifood systems more resilient to shocks and stresses*. Food and Agriculture Organization of the United Nations. Retrieved from: https://www.researchgate.net/publication/359160007_The_State_of_Food_and_Agriculture_2021_agrifood_systems_resilient_to_shocks_and_stresses.

Feliciano, D. (2019). A review on the contribution of crop diversification to sustainable development goal 1 "no poverty" in different world regions. *Sustain. Dev.*, **27**: 795–808. DOI: 10.1002/sd.1923.

Gacheno, D.; Chanyalew Seyoum, C. and Lemma, T. (2025). Impact of adoption of climate-smart agricultural practices (CSAP) on small-holder farmers' income: in Adami Tullu Jido Kombolcha district, Ethiopia. *Discover Agriculture*, **3:** 1-23. https://doi.org/10.1007/s44279-025-00334-0.

Geetahkutty, P. S. (1993). Fertilizer use behavior of rice farmers in Kerala. Ph. D. Thesis (Unpublished), K.A.U., Thrissur, Kerala.

Gohil, G. R.;.Raviya, P. B. and Barad, V. G. (2016). Association between the adoption of crisis management practices and selected profile characteristics of cotton growers. *Guj. J. Ext. Edu.*, **27(1):** 67-69.

Government of India. (2018). *India: Second Biennial Update Report to the United Nations Framework Convention on Climate Change*. Ministry of Environment, Forest and Climate Change, New Delhi, India.

Government of India. (2022). *Agricultural statistics at a glance*. Ministry of Agriculture and Farmers Welfare, New Delhi, India.

IPCC. (2021). *Climate Change 2021: The physical science basis*. Cambridge University Press, Cambridge, United Kingdom and New York, 2391 pp. https://doi.org/10.1017/9781009157896.

Islam, Md. S.; Kabir, M. H.; Ali, Md. S.; Sultana, Mst. S. and Mahasin, M. (2019). Farmers' Knowledge on Climate Change Effects in Agriculture. *Agricultural Sciences*, **10**: 386-394.

Jaryal, R. D.; Jevlya, D. Savaliya, V. J. and Thakur, A. (2025). Socio-economic dimensions of climate change adaptation among farmers in Saurashtra region

of Gujarat. *International Journal of Agriculture Extension and Social Development*, **8(6)**: 368-375.

Kerlinger, F. N. (1973). Foundation of Behavioural Research. Surjeet Publication, New Delhi. pp. 379.

Khati, K. and Amardeep. (2020). Relationship of farmers profile with adoption of climate resilient practices in hilly region of Uttarakhand, India. *Int. J. Curr. Microbiol. App. Sci.*, **9(2):** 2180-2191.

Khatri-Chhetri, A.; Aggarwal, P. K.; Joshi, P. K. and Vyas, S. (2016). Farmers' prioritization of climate-smart agriculture technologies. *Agricultural Systems*, **151**: 184–191.

Limbachiya, M. A. (2022). Information seeking behaviour of the members of fig_s on animal husbandry enterprise in Banaskantha district. M. Sc. (Agri.) Thesis (Unpublished), Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar, Gujarat.

Mall, R. K.; Gupta, A.; Singh, R.; Singh, R. S. and Rathore, L. S. (2006). Water resources and climate change: An Indian perspective. *Current Science*, **90(12)**: 1610–1626.

Mallappa, V. K. H. and Pathak, T. B. (2023). Climate smart agriculture technologies adoption among small-scale farmers: a case study from Gujarat, India. *Sustainable Food Systems*, DOI: 10.3389/fsufs.2023.1202485.

Mohammad, E. (2020). A study on knowledge and adoption of paddy cultivation practices in Hosanagara taluka of Shivamogga district. M. Sc. (Agri.) Thesis (Unpublished), University of Agricultural and Horticultural Sciences, Shivamogga.

Naik, B. M.; Singh, A. K.; Maji, S. and Venkatesan, P. (2024). Exploring Farmers Attitudes towards Climate Resilient Agricultural Technologies in Telangana State, India. *International Journal of Environment and Climate Change*, **14(7)**: 171-180.

Namdeo, S.; Gupta, S.; Tomar, A. and Jatav, H. R. (2023). Constraints encountered by farmers in adapting climate resilient practices in Madhya Pradesh. *International Journal for Multidisciplinary Research (IJFMR)*, **5(4)**.

Ninama, A. P.; Patel, J. K. and Vihariya, P. H. (2023). Antecendents of farmers with special reference to drought situation. *Gujarat Journal of Extension Education*, **35(1)**: 30-33.

Nirban, A. J. (2004). Analysis of the agricultural produce market committee in Konkan and western Maharashtra with preference to their potential role in agricultural market extension. Ph. D. Thesis (Unpublished), Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra.

Patel, S. B.; Bhatt, M. R.; Jayan, A. R. and Sanjay V. C. (2025). Constraints and suggestions perceived by farmers due to climate change in south Gujarat region. *International Journal of Agriculture Extension and Social Development*. **8(7)**: 420-423.

Pokar, M. V. (2023). Impact of frontline demonstrations of chickpea production technology under national food security mission (NFSM) scheme in Saurashtra region of Gujarat. Ph. D. (Agri.) Thesis (Unpublished), Junagadh Agricultural University, Junagadh.

Rajkhowa, A.; Barman, I.; Das, P. K.; Deka, S. D. and Sonowal, A. (2020). An analysis of extent of farm mechanization in north bank plains agro-climatic zone of Assam. *Asian Journal of Agricultural Extension, Economics & Sociology*, **38(11)**: 81-90.

Rame Gowda, B. L. (1991). Crisis management by farmers – an analysis. Ph.D. Thesis (Unpublished), University of Agricultural Sciences, Bengalore.

Rathava, S. G. (2023). Farmers' perception and their adaptation strategies about climate change in north Gujarat. Ph. D. (Agri.) Thesis (Unpublished), Sardarkrushinagar Dantiwada Agricultural University Sardarkrushinagar, Gujarat.

Raval, K. N.; Patel, J. K. and Dhola, A. B. (2023). knowledge level of crisis management practices by the cumin growers. *Gujarat Journal of Extension Education*, **36(1)**. https://doi.org/10.56572/gjoee.2023.36.1.0005.

Sandeep, G. P.; Ganesamoorthi, S. and Raghuprasad, K. P. (2023). Comprehensive study on the profile characteristics analysis of farmers in Telangana. *The Pharma Innovation Journal*, SP-**12(8)**: 1569-1573.

Sanjay, V. C. (2021). A study on crisis management behaviour of sugarcane growers in selected districts of Karnataka. Ph. D. (Agri.) Thesis (Unpublished), Uttar Banga Krishi Viswavidyalaya, West Bengal.

Saravanan, K. P.; Manivannan, C. and Kathiravan, G. (2020). Determinants of perceived extent of crisis in sheep farming. *Journal of Entomology and Zoology Studies*, **8(3)**: 1911-1915.

Shwetha, N. V. and Shivalingaih, Y. N. (2018). Personal and socio-psychological characteristics of farmers in association with performance of different farming systems adopted by farmers in Chickaballapura district of Karnataka. *India Int.J.Curr.Microbiol.App.Sci*., **7(3)**: 787-793.

Sindhu, M. U.; Shivalingaiah, Y. N.; Shivanna, B.; Vinay Kumar, R.; Pankaja, H. K. and Mohan Kumar, T. L. (2024). Farmers Vulnerability to Climate Change in Telangana State - A Critical Analysis. *Mysore J. Agric. Sci.*, **58(4):** 111-122.

Singh, S. N. and Singh, K. N. 1970. Farm mechanization index. Measurement in Extension Research Instrument Development by IARI, Division of Agril. Extn., New Delhi. Compiled by K. N. Singh and others. 1963-72. pp. 178-181.

Supe, S. V. (1969). Factors related to different degree of rationality in decision making among farmers, Ph.D. Thesis (Unpublished), IARI, New Delhi.

Tankodara, K. D. (2019). Knowledge and adoption of farmers about chickpea production technology in Junagadh district. M. Sc. (Agri.) Thesis (Unpublished), Junagadh Agricultural University, Junagadh.

Vamshi, G.; Kharade, P. P. and Tale, P. S. (2025). Crisis management practices followed by the nursery owners. *International Journal of Agriculture Extension and Social Development*, **8(8)**: 186- 190.

Vinay Kumar, H. M. (2015). Management of climate induced crisis by the farmers of coastal region of Karnataka state - a critical analysis, Ph.D. Thesis (Unpublished), University of Agricultural Sciences, Bengalore.

Signature of Student | Signature of Major Guide

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CERTIFICATE

This is to certify that **Miss. MEGHNATHI AXITA ASHOKGIRI (Registration No.: 1010125015)** has made an oral presentation of the synopsis of research project entitled **"Climate Change Induced Crisis Management by Farmers of Coastal Saurashtra"** in **Department of Agricultural Extension Education, College of Agriculture, JAU, Junagadh** dated **24/02/2026** in the presence of advisory committee members, other faculty members and post graduate students. The student has incorporated all the suggestions.

Signature of major guide and the members of advisory committee

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